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| BMDO RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit) |                   |                     |                     |  |                     |                     |                     | DATE<br><b>February 1999</b> |                     |            |
|--|-------------------|---------------------|---------------------|--|---------------------|---------------------|---------------------|------------------------------|---------------------|------------|
| BUDGET ACTIVITY<br><b>2 - Applied Research</b>     |                   |                     |                     | PE NUMBER AND TITLE<br><b>0602173C Support Tech - Applied Research</b> |                     |                     |                     |                              |                     |            |
| COST ( <i>In Thousands</i> )                       | FY 1998<br>Actual | FY 1999<br>Estimate | FY 2000<br>Estimate | FY 2001<br>Estimate  | FY 2002<br>Estimate | FY 2003<br>Estimate | FY 2004<br>Estimate | FY 2005<br>Estimate          | Cost to<br>Complete | Total Cost |
| Total Program Element (PE) Cost                    | 109888            | 97436               | 65328               | 52992  | 43925               | 39384               | 38262               | 31675                        | TBD                 | TBD        |
| 1180 Surveillance Technology                       | 0                 | 1780                | 0                   | 0  | 0                   | 0                   | 0                   | 0                            | TBD                 | TBD        |
| 1280 Interceptor Technology                        | 0                 | 963                 | 0                   | 0  | 0                   | 0                   | 0                   | 0                            | TBD                 | TBD        |
| 1461 BMC4I   | 0                 | 5203                | 0                   | 0  | 0                   | 0                   | 0                   | 0                            | TBD                 | TBD        |
| 1651 Innovative Science and Technology (IST)       | 52817             | 22975               | 7858                | 7911   | 7894                | 7875                | 7871                | 7862                         | Continuing          | Continuing |
| 1660 Statutory and Mandated Programs               | 57071             | 66515               | 57470               | 45081  | 36031               | 31509               | 30391               | 23813                        | Continuing          | Continuing |

**A. Mission Description and Budget Item Justification**

This program element includes the only applied research projects in the Department of Defense which focus specifically on future BMDO technical requirements.

To prepare to meet critical future active defense needs, the Innovative Science and Technology (IST) project invests in an aggressive program of high leverage technologies that yield markedly improved capabilities across a selected range of boost phase and terminal defense interceptors, advanced target sensors, and innovative science. The objectives of these investments are to provide: (1) component technologies that offer improved performance or reduced costs for BMDO acquisition programs; (2) a better understanding of the material characteristics and physics for processes that form the basis of technologies that support these acquisition programs; and (3) technical solution options to mitigate unpredicted threats. Unlike other BMDO projects that fund near-term technology and testing efforts, this advanced technology initiative invests seed money in high-risk technologies that could significantly change how BMDO develops future systems. The technologies pursued include: next generation sensors, power, information processing, optics, advanced materials, propulsion, and communication. This project causes and exploits breakthroughs in science that will keep BMD at the foremost edge of what is possible. A primary project goal is to conduct proof-of-concept demonstrations of some of these breakthroughs that will aid in transitioning the technology to development programs. Demonstration programs have been transferred to projects 1180, 1280, and 1461 in FY99.

The Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) programs for all of BMDO are managed under project 1660. Pursuant to PL 102-564, a two-phased competition for small businesses with innovative technologies is conducted, focusing on BMDO relevant technologies with an emphasis on technologies with dual use potential.

The Technology Applications (TA) Program, established in 1986, makes technology from all parts of BMDO available to federal agencies, state and local governments, and U.S. business and research interests. The program objective is to develop and support the transfer of BMD derived technology to other Department of Defense applications as well as other federal, state and local government agencies, federal laboratories, universities and the domestic, commercial and private sector.

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| <p>Incorporation of these by the private sector and other government agencies can result in reduced unit costs and further improvements to be made available for applications in BMDO systems.</p> <p>The Historically Black Colleges and Universities/Minority Institutions (HBCU/MI) program is managed in project 1660 under this program element (starting in FY99). The HBCU/MI Program increases and improves the participation of minority colleges and institutions in the BMDO program. It also responds to Section 832 of Public Law (PL) 101-510, which establishes a specific goal for HBCUs and MIs within the overall five percent goal for minority business contracts, and introduces them to BMDO technologies and the particulars of the BMDO procurement process.</p> <p>Many of today's baseline technologies on BMDO systems like Theater High Altitude Area Defense (THAAD), Patriot Advanced Capability (PAC3), and Ground Based Radar (GBR) are available due to the wise investment in innovative technologies some 10 years ago. Examples include: indium antimonide (InSb) and mercury cadmium telluride (HgCdTe) ultra-sensitive infrared detectors; 32-bit radiation hardened Reduced Instruction Set Computer (RISC) processors for image analysis; composite materials for lightweight satellite structures; interferometric fiber-optic gyroscopes for sophisticated guidance and control; and solid-state gallium arsenide (GaAs) transmitter/receivers for BMDO radars.</p> <p><u>Acquisition Strategy:</u> The IST R&amp;D program receives proposals in response to an annual Broad Agency Announcement (BAA) of research opportunities. Proposals received are competitively judged according to BMD relevance, cost, and capabilities of the offeror. The HBCU/MI program also receives proposals in response to an annual BAA. For the SBIR and STTR programs, strong emphasis is placed on the dual-use nature of the proposed effort. BMDO conducts an annual SBIR/STTR solicitation and competition, and the executing agents award and manage the contracts. BMDO employs government executing agents, called Science and Technology Agents (STAs) from the three services and NASA, with each STA responsible for a specific technical area.</p> <p><b>FY 1998 Accomplishments:</b></p> <ul style="list-style-type: none"> <li>52817 IST BM/C3: Invested in neural networks for image recognition, optical image processing, and multi-sensor tracking. Invested in ultra-stable laser diodes for optical communication; terahertz communication sources; advanced computer architectures; and spread-spectrum CDMA communications modem. Began preparation for proof-of-principal tests of Virtual Distributed Hardware-in-the-Loop Testbed (VDHTB). VDHTB Program to transition to PMA 1461 in FY99. Materials: Invested in wide band-gap semiconductors and finalized prototype design of gallium nitride (GaN)-based high microwave power amplifier operated at 300 degrees Centigrade. Sensors: Demonstrated Fast Frame Seeker capability against simulated infrared cruise missile targets with a gimbaled airborne platform. Invested in high-impulse solid propellants; electric propulsion thrusters; and propellant manufacturability. Propulsion: Conducted Express/T-160 Hall effect thruster flight test critical design review (CDR). Invested in advanced switching for radar; high-efficiency solar cells and concentrators; and miniature interceptor guidance technology. Power: Initiated development of an advanced thermal battery for interceptors.</li> <li>57071 SBIR/STTR : 190 Phase I SBIR Awards to 155 firms and 75 Phase II SBIR awards to 70 firms</li> </ul> <p>Total 109888</p> |  |  |
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| <b>FY 1999 Planned Program:</b> <ul style="list-style-type: none"> <li> <div> 22975 IS&amp;T: BMC3: Invest in ultra-stable laser diodes for optical communication; terahertz communication sources; advanced computer architectures; and spread-spectrum CDMA communications modem. Materials: Continue to invest in wide band-gap semiconductors; polymer-based electronics and digital superconducting electronics, based on technical progress and system technology needs. Conduct a critical design review for the Dual Mode Bow Shock Interaction experiment. Continue to invest in high-impulse solid propellants; electric propulsion thrusters; and propellant manufacturability, based on technical progress and system technology needs. Conduct Express/T-160 Hall effect thruster flight test. Power: Continue to invest in high-efficiency solar arrays, based on technical progress and system technology needs. </div> </li> <li> <div> 1000 Tech. Apps. (1660): TA Database: Maintain up-to-date information on potential BMD programs that have commercial applications. Update graphics and interactive modes into national information infrastructure on BMD-sponsored technologies. Panel Reviews: Provide assistance to large, medium and small businesses wishing to bring BMD-supported technology to the commercial market. Outreach: Develop assistance publications, brochures and target articles for journals and newspapers, quarterly newsletters, conference exhibits, and advertisements in reports on BMDO technology. Networking: Expand results of technology transfer by working with other Federal technology transfer organizations and activities such as the OSD Director DDR&amp;E Office of Technology Transition, NASA and DOE. Interact with professional/technical associations and societies involved with technology transfer and commercialization. </div> </li> <li> <div> 64166 SBIR/STTR : Estimated 220 Phase 1 SBIR Awards to 180 firms and 85 Phase II SBIR awards to 80 firms </div> </li> <li> <div> 1349 HBCU/MI : Will incrementally fund an estimated 10 contracts in the areas of electronics, sensors, materials, and BMC3. </div> </li> <li> <div> 7946 Demonstration projects for fault tolerant computing, high rate data processing, satellite to ground laser communications, Gallium Nitride (GaN) power amplifiers, innovative sensor fusion algorithms and processors, and miniature interceptor technologies formerly executed under Project 1651 but to be excuted under Projects 1180, 1280, and 1461 in FY1999. </div> </li> </ul> <div> Total 97436 </div> |  |  |
| <b>FY 2000 Planned Program:</b> <ul style="list-style-type: none"> <li> <div> 7858 Continue to investigate various BMC3, materials, sensors, propulsion, and power technologies, based on technical progress and system technology needs. Conduct the Dual Mode Bow Shock Interaction experiment </div> </li> <li> <div> 1000 Tech. Apps. (1660): TA Database: Maintain up-to-date information on potential BMD programs that have commercial applications. Update graphics and interactive modes into national information infrastructure on BMD-sponsored technologies. Panel Reviews: Provide assistance to large, medium and small businesses wishing to bring BMD supported technology to the commercial market. Outreach: Develop assistance publications, brochures and target articles for journals and newspapers, quarterly newsletters, conference exhibits, and advertisements in reports on BMDO technology. Networking: Expand results of technology transfer by working with other Federal technology transfer organizations and activities such as the OSD Director DDR&amp;E Office of Technology Transition, NASA and DOE. Interact with professional/technical associations and societies involved with technology transfer and commercialization. </div> </li> <li> <div> 55164 SBIR/STTR : Estimated 195 Phase 1 SBIR Awards to 160 firms and 75 Phase II SBIR awards to 70 firms </div> </li> <li> <div> 1306 HBCU/MI : Will incrementally fund an estimated 10 contracts in the areas of electronics, sensors, materials, and BMC3. </div> </li> </ul> <div> Total 65328 </div>  |  |  |
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## BMDO RDT&amp;E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)

DATE  
February 1999BUDGET ACTIVITY  
**2 - Applied Research**PE NUMBER AND TITLE  
**0602173C Support Tech - Applied Research****FY 2001 Planned Program:**

- 7911 Continue to investigate various BMC3, materials, sensors, propulsion, and power technologies, based on technical progress and system technology needs.
  - 1000 Tech. Apps. (1660): TA Database: Maintain up-to-date information on potential BMD programs that have commercial applications. Update graphics and interactive modes into national information infrastructure on BMD-sponsored technologies. Panel Reviews: Provide assistance to large, medium and small businesses wishing to bring BMD-supported technology to the commercial market. Outreach: Develop assistance publications, brochures and target articles for journals and newspapers, quarterly newsletters, conference exhibits, and advertisements in reports on BMDO technology. Networking: Expand results of technology transfer by working with other Federal technology transfer organizations and activities such as the OSD Director DDR&E Office of Technology Transition, NASA and DOE. Interact with professional/technical associations and societies involved with technology transfer and commercialization.
  - 42779 SBIR/STTR : Estimated 175 Phase I SBIR Awards to 145 firms and 70 Phase II SBIR awards to 65 firms
  - 1302 HBCU/MI : Will incrementally fund an estimated 10 contracts in the areas of electronics, sensors, materials, and BMC3.
- Total 52992

| <b>B. Program Change Summary</b>                    | <u>FY 1998</u> | <u>FY 1999</u> | <u>FY 2000</u> | <u>FY 2001</u> |
|---|----------------|----------------|----------------|----------------|
| Previous President's Budget ( <u>FY 1999</u> PB)    | 109628         | 86866          | 79370          | 75295          |
| Congressional Adjustments                           |                | 11000          |                |                |
| Appropriated Value                                  |                | 97866          |                |                |
| Adjustments to Appropriated Value                   |                |                |                |                |
| a. Congressional Reductions (FFRDC, Inflation, etc) |                | -430           |                |                |
| b. OSD Reductions                                   |                |                |                |                |
| c. Emergency Supplemental                           |                |                |                |                |
| Adjustments to Budget Years Since <u>FY 1999</u> PB |                |                |                |                |
| Current Budget Submit ( <u>FY 2000 / 2001</u> PB)   | 109888         | 97436          | 65328          | 52992          |

Change Summary Explanation: